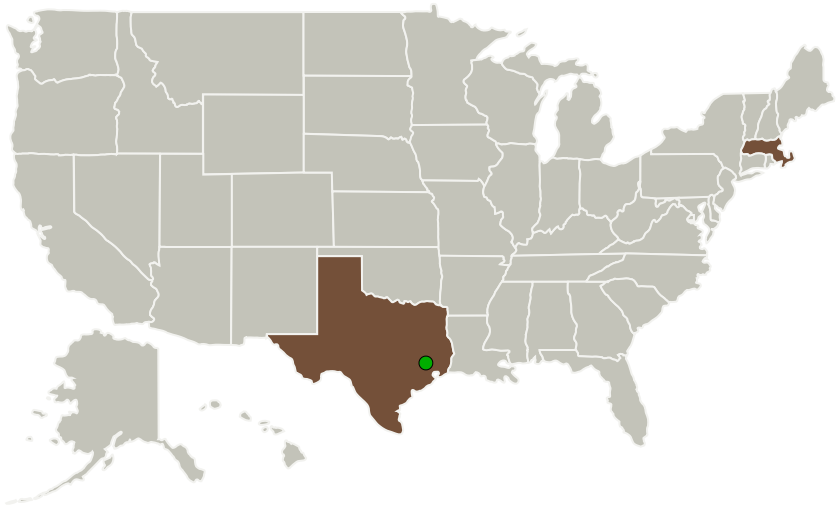
On Orbit Immuno-Based, Label-Free, White Blood Cell Counting System with MicroElectroMechanical Sensor (MEMS) Technology (OILWBCS-MEMS), Phase II

Completed Technology Project (2010 - 2012)

Project Introduction

Aurora Flight Sciences Corporation and partner, Draper Laboratory, propose to develop an on-orbit immuno-based label-free white blood cell counting system using MEMS technology (OILWBCS-MEMS) for human spaceflight experimental and medical monitoring practices. Our proposed system is designed to meet NASA's requirements for a microgravity compatible, miniaturized, light weight peripheral blood cell counting instrument capable of on-orbit cell counting, without high energy lasers, requiring minimal sample volume or exogenous (sheath) fluid, and generating minimal bio-hazardous waste: SBIR topic X14.02 "On Orbit Cell Counting and Analysis Capability". The proposed detection technology leverages changes in optical transmission through a surface due to molecular binding (e.g., antibody-antigen binding). Antibodies specific to the white blood cell surface protein markers (antigens) are pre-coated on the sensor surface to recognize specific white blood cell types with inherently high specificity and sensitivity. In Phase I we developed surface chemistry and demonstrated surface chemistry sensitivity and specificity for total white blood cells and two lymphocyte subtypes (B-cells, CD4+ T-cells). During phase II we will develop a functional prototype of the OILWBCS-MEMS device to demonstrate that end-to-end operations from sample-in to signal-out produces clinically relevant results. The OILWBCS-MEMS design will include single-use replaceable cartridges for fluid loop and sensor components.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Massachusetts	Texas

Project Transitions

June 2010: Project Start

August 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139309)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

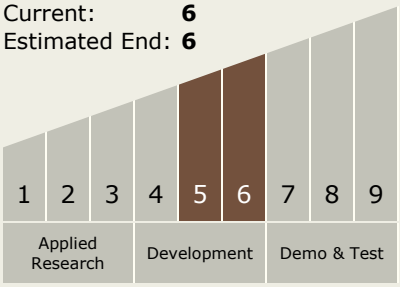
Carlos Torrez

Principal Investigator:

Jessica Edmonds

Technology Maturity (TRL)

Start: **5**
Current: **6**
Estimated End: **6**



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Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.3 Human Health and Performance
    - TX06.3.1 Medical Diagnosis and Prognosis

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System